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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/520,846	01/11/2005	Yongfa Zhu	038873-0104	2680
22428 7590 06/25/2008 FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007			EXAMINER VETTER, ROBERT A	
			ART UNIT	PAPER NUMBER
			1792	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

## Application No.

10/520,846

## Applicant(s)

ZHU ET AL.

## Examiner

ROBERT VETERE

## Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 January 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-8508)  
Paper No(s)/Mail Date 1/05/3/05
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1, and 8-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura et al. (US 6,228,480) in light of Ganguli et al. (US 6,514,454), Tanaka et al. (US 5,879,811), Fry (US 4,428,863), Hayakawa et al. (US 6,013,372), Nemeth et al. (US 5,466,835) and Stamires et al. (US 6,506,358).

**Claims 1, 8-9, 13-14 and 16:** Kimura teaches a method of coating a non-woven fabric with a photocatalyst (4:5-12) comprising the steps of pulling and coating the fabric (6:18-37) through a titanium oxide sol gel (6:38-65; 8:42-57) and drying the coated fabric (10:36-56).

What Kimura fails to teach is the method by which the titanium dioxide sol gel is formed. Ganguli teaches a method of forming a titanium dioxide sol gel (Abst.; 6:6-18) comprising the steps of making a precursor solution comprising ethanol, water (3:30-39) and tetrabutyl titanate (1:18-23) to form a porous gel (2:48-64) and aging the gel for 36-100 hours (3:60-64) in an autoclave (3:52-4:7). Because Kimura does not limit the method by which the titanium dioxide sol gel is formed and because Ganguli teaches a method of forming a titanium dioxide sol gel, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the sol gel by the method of Ganguli and then coated this sol gel onto a fabric, according to the method of Kimura, with the predictable expectation of success.

Kimura and Ganguli fail to teach that the solution used to form the sol gel comprises diethanolamine. Tanaka teaches the formation of a sol gel wherein diethanolamine is added to the precursor solution to stabilize the precursor solution (6:46-52). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included diethanolamine in the solution of Ganguli in order to have stabilized the solution.

Kimura, Ganguli, and Tanaka fail to teach that the precursor solution also contains a pore-forming agent. Ganguli, however, does teach that it is desirable that the precursor solution forms a porous gel (2:48-64). Fry teaches a method of forming a porous membrane using a precursor solution which comprises a metal oxide and water (2:63-67). To this solution, polyglycol is added as a pore forming agent (3:15-28). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included polyglycol as a pore forming agent in the solution of Ganguli in order to have assisted in forming a porous gel.

These references, taken together, fail to teach that the coated fabric is crystallized. Hayakawa teaches a method of depositing a layer of photocatalytic precursor onto a substrate and then crystallizing the layer in order to make it into a photoactive photocatalyst (9:36-36). Thus, because both Kimura and Hayakawa teach methods of depositing a photocatalytic substance onto a substrate, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have crystallized the photocatalyst, as taught by Hayakawa, in the combined method of Kimura, Ganguli, Fry and Tanaka in order to have made the photocatalyst photoactive.

These reference, taken together, do not teach that the photocatalyst is crystallized at 60-200°C. Nemeth teaches a method of hydrothermally crystallizing a titanium oxide sol gel at about 150°C (5:21-45). Thus because both Nemeth and the combined method of Kimura, Ganguli, Fry, Tanaka and Hayakawa teach methods of crystallizing photocatalytic gels, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have crystallized the sol gel at about 150°C with the predictable expectation of successfully crystallizing the titanium dioxide sol gel.

These references, taken together, fail to teach that the crystallization is carried out in a hydrothermal kettle. However, Nemeth teaches that the crystallization is carried out hydrothermally and Stamires explains that it is known in the art to use a hydrothermal kettle in the presence of ethanol and water to carry out crystallization (5:41-45). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a hydrothermal kettle to carry out the crystallization process with the predictable expectation of success.

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With respect to the concentration limitations, generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have found the optimal concentrations necessary for forming a sol-gel of titanium dioxide to be coated onto the fabric substrate.

**Claim 10:** Tanaka also teaches that the thickness of the gel coated film can be controlled by spinning the coated substrate (5:42-52). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have spun the coated substrate in order to have controlled the thickness of the sol gel coating.

**Claims 11-12:** Kimura also teaches that the coated substrate is dried at a temperature between 50 and 200°C (10:52-54). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

**Claim 15:** Nemeth teaches that the temperature used for crystallization is about 150°C (5:21-45), but Hayakawa also teaches that the temperature can vary depending on the composition of the catalytic coating (see, e.g., 11:59-12:37). "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 105 USPQ 233, 235 (CCPA 1955). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have optimized the temperature used in the crystallization process with the predictable expectation of success.

3. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamires in light of Tabatabaie-Raissi et al. (US 6,309,611).

**Claim 3:** Ganguli explains that the titania sol gel can also contain dopants, but does not expressly teach that lanthanum is used as a dopant. Tabatabaie teaches a titanium dioxide photocatalyst

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(Abst.) which contains lanthanum nitrate as a dopant (11:38-50). Thus, because Ganguli teaches that dopants can be added and because Tabatabaie teaches the use of lanthanum nitrate as a dopant in a titania photocatalyst, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have include lanthanum nitrate in the sol gel of the combined method of Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamiros with the predictable expectation of successfully creating a photocatalytic titania sol gel.

**Claims 4-5:** With respect to the concentration limitations, generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have found the optimal concentrations necessary for forming a sol-gel of titanium dioxide to be coated onto the fabric substrate.

4. Claims 3 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamiros in light of Masuhara et al. (US 6,951,463).

**Claim 3:** Kimura teaches that the sol gel coated onto the fabric substrate can include silicon as a dopant (7:3-15), but fails to teach that the silicon precursor is n-butyl silicate. Masuhara teaches the preparation of a photocatalytic titania (Abst.), wherein the titania sol is doped with butyl silicate (9:16-48). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected butyl silicate as the dopant in the titania sol gel of the combined method of Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamiros.

**Claims 6-7:** See discussion of claims 4-5, above.

5. Claims 2, and 22-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamiros in light of Ohmori et al. (US 6,340,711).

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**Claims 2, 22-23, 27-28 and 30:** Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamires teach all the limitations of claims 2, 22-23, 27-28 and 30, as discussed above, with respect to claims 1, 8-9, 13-14 and 16, except that these references do not teach that titanium tetrachloride is used as the titania precursor in the sol gel. Ohmori teaches the use of titanium tetrachloride as a precursor for forming a titania sol gel (Abst.). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substitutes titanium tetrachloride for tetrabutyl titanate in the combined method of Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth and Stamires with the predictable expectation of success.

**Claim 24:** See discussion of claim 10, above.

**Claims 25-26:** See discussion of claims 11-12, above.

**Claim 29:** See discussion of claim 15, above.

6. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth, Stamires and Ohmori in light of Tabatabaie.

**Claims 17-19:** See discussion of claims 3-5 above.

7. Claims 17 and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kimura, Ganguli, Fry, Tanaka, Hayakawa, Nemeth, Stamires and Ohmori in light of Masuhara.

**Claims 17 and 20-21:** See discussion of claims 3 and 6-7, above.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT VETERE whose telephone number is (571)270-1864. The examiner can normally be reached on Mon-Fri 9-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert Vetere/  
Examiner, Art Unit 1792

/Timothy H Meeks/  
Supervisory Patent Examiner, Art Unit 1792